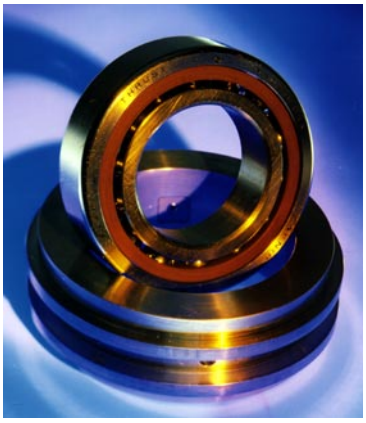
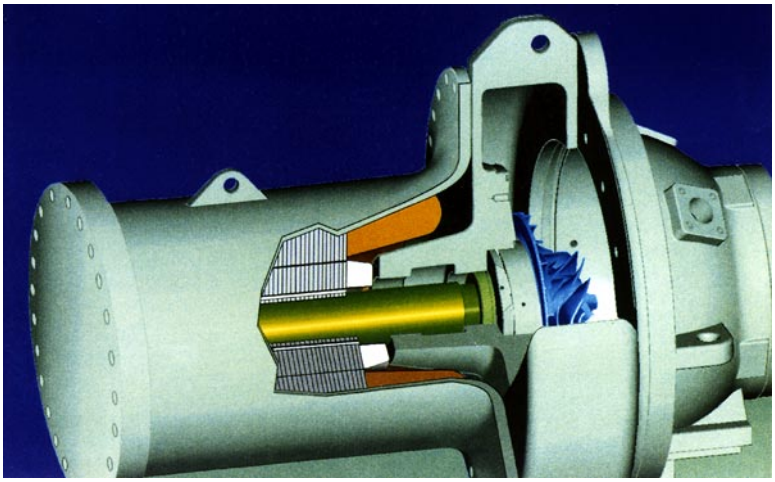
Technology Opportunity

Tribology Tests and Evaluations at Marshall Space Flight Center



Tribology – the study of friction, lubrication, and wear of surfaces in relative motion – is the subject of many tests and evaluations being conducted at NASA's Marshall Space Flight Center (MSFC) in Huntsville, Alabama. These scientists and engineers are searching for ways to provide more efficient, longer-lasting moving parts. NASA scientists are working with industry engineers to develop better bearing components for use in high-speed machinery.

Although Marshall's need to develop state-of-the-art tribological materials and components for NASA's on-going space program is spurring these technological advances, there are also industrial applications for this technology.



Potential Commercial Uses

High-speed, high-performance machinery is plagued by periodic maintenance and replacement of worn parts. Tribology investigations are important to manufacturers who provide aerospace components, air conditioning and refrigeration parts, and devices used in power plants with high-speed turbines.

Benefits

Many moving parts are often difficult and expensive to service or replace. Breakthroughs in the field of tribology will result in savings of both time and money for U.S. industry.

The Technology

Marshall's tribological test capabilities allow engineers to work in a hands-on environment, studying the fundamental concepts of tribology. MSFC scientists are able to recognize, understand, and solve problems with friction, lubrication, and wear as they conduct investigations ranging from the basic four-ball wear tests to high-speed cryogenic turbopump bearing tests.

Pub 5-537-2(05)

National Aeronautics and Space Administration

George C. Marshall Space Flight Center

Hydrostatic Bearing Tests

The hydrostatic bearing test rig at MSFC is a fully functional device used to evaluate the performance of hydrostatic bearing designs. The current bearing design is for liquid hydrogen, nitrogen, or oxygen to be used as the working fluid. Other bearing designs can be developed and fitted into the tester for refrigerants and coolants. This tester, rated for 2000 pounds per square inch internal pressure and a speed rating of 80,000 revolutions per minute, can be used to evaluate hydrostatic bearing designs that might be used in cryogenic pumps, high-speed power turbines, jet engines, large refrigeration systems, and anywhere else the process fluid might be used as the fluid media.

Bearing and Seal Material Testing

MSFC's Bearing and Seal Material Tester is a high-performance diesel engine that drives rotor-bearing assemblies at speeds above 30,000 revolutions per minute.

An eight-station Rolling Contact Fatigue Machine is used to test the fatigue life of newly developed bearing materials and hard, thin-film coatings to identify the fatigue life of the bearing material.

A wide variety of materials, coatings, and lubricants are tested under differing conditions of friction and wear in Marshall's Falex Multispecimen Test Machine.

Lubricants are evaluated in a Shell Four-ball Wear Tester at MSFC to show the performance of different materials such as oils, greases, or dry film lubricants.

To test line contact with pure sliding, MSFC engineers use a Falex Pin and Vee Block Tester to measure the torque necessary to rotate the pin between two vee blocks.

MSFC's Traction Rig Tester simulates sliding-to-rolling contact ratio. This testing device is used to screen improved cryogenic bearing materials and lubricants.

A Long-Term Vacuum Lubrication Test System allows MSFC scientists and engineers to test a variety of commercially available lubricants for machinery that must function unattended for long periods of time.

The viscosity of oils and greases is tested in MSFC's Brookfield Viscometers. Rotating cylinder viscometers measure the drag torque of a cylinder submerged in a sample of lubricant material.

Contacts

Technology Transfer Office
Mail Code LA01
NASA/MSFC
Marshall Space Flight Center, AL 35812

Additional information about NASA's Technology Transfer Program and a Technology Transfer Agreement are available on the World-Wide Web:

(http://techtran.msfc.nasa.gov)

Key Words

Tribology
Bearing and Seal Technology
Technology Transfer